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## FOREST PEST LEAFLET 41

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**Gypsy Moth**P. A. Godwin<sup>1</sup>PROCUREMENT SECTION  
CURRENT SERIAL RECORDS

The gypsy moth (*Porthetria dispar* (L.)), a native of Europe and Asia, was introduced into North America at Medford, Mass. in 1896. It is now the most serious defoliator of deciduous forests in the northeast and is potentially the most serious defoliator of hardwoods in the Eastern United States. Since its introduction Federal and State governments have spent millions of dollars in unsuccessful attempts to eradicate it or prevent its spread.

Within the geographic range of its hosts, the gypsy moth now generally infests the New England States and New Jersey. Large parts of eastern New York and Pennsylvania, as well as sections of Delaware and Maryland, are also infested. An isolated infestation has been found in central Virginia as well. Isolated local infestations formerly found in Michigan, New York, and Pennsylvania, appear now to have been eradicated (fig. 1).

**Description**

The full-grown male larva is about  $1\frac{1}{2}$  inches long; the female is usually larger and may be over 2 inches long (fig. 2, D). The head capsule is yellow with brown or black patches and spots. An irregular mottling of black, gray, and cream gives the body a

general gray color. Each body segment has 6 or 8 wartlike lumps from which grow tufts of bristles and hairs of black or brown or both colors.

The lumps along the back of the caterpillar are brightly colored. The first 5 pairs are blue, and the following 6 pairs are red. Care should be taken in handling the caterpillars because the bristles are sharp and exude a substance that is irritating to the skin. Some people are very allergic to this material.

Gypsy moth pupae are reddish brown and sparsely covered with red hairs. Usually they are draped with a few strands of coarse silk. The female pupa (fig. 2, C) is about an inch long; the male pupa is usually smaller.

The male gypsy moth is a light- to dark-brown moth and has a wing spread of  $1\frac{1}{2}$  to 2 inches (fig. 2, A). The forewings have a band of dark brown or black along the edge and irregular bands or lines of the same color across the center of the wings.

Females have a light-brown or buff-colored body, which is very large for the size of the wings (fig. 2, B). The forewings are white and have a pattern of light brown bands. Along the outer edge is a row of dark spots.

The eggs are laid in masses of 100 to 1,000 or more intermixed with hairs and scales from the female's abdomen (fig. 2, E). At first the eggs are cream colored or light greenish tan. As the

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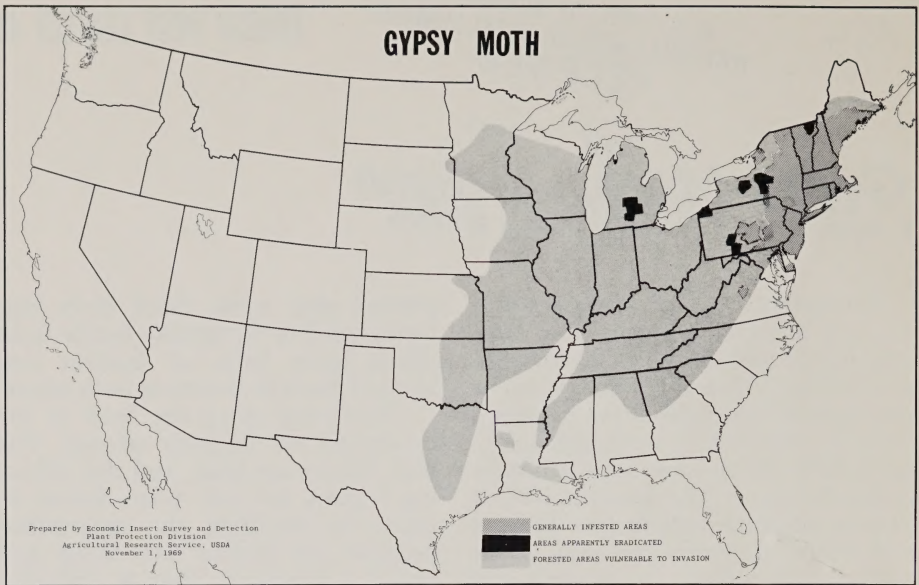


Figure 1.—Present distribution of the gypsy moth within the United States.

embryo develops, it can be seen through the shell, so that older eggs look grayish. The eggs are about  $\frac{3}{64}$  inch in diameter and are slightly flattened on two sides.

### Life History and Habits

The gypsy moth has one generation a year. It spends the winter in the egg stage. As soon as warm weather arrives, usually in early May in New England, the eggs hatch. The tiny larvae crawl from the egg mass in search of foliage, often spinning down on silk threads as they move around. At this time they may be blown considerable distances, and it is in the first larval instar that most spreading occurs.

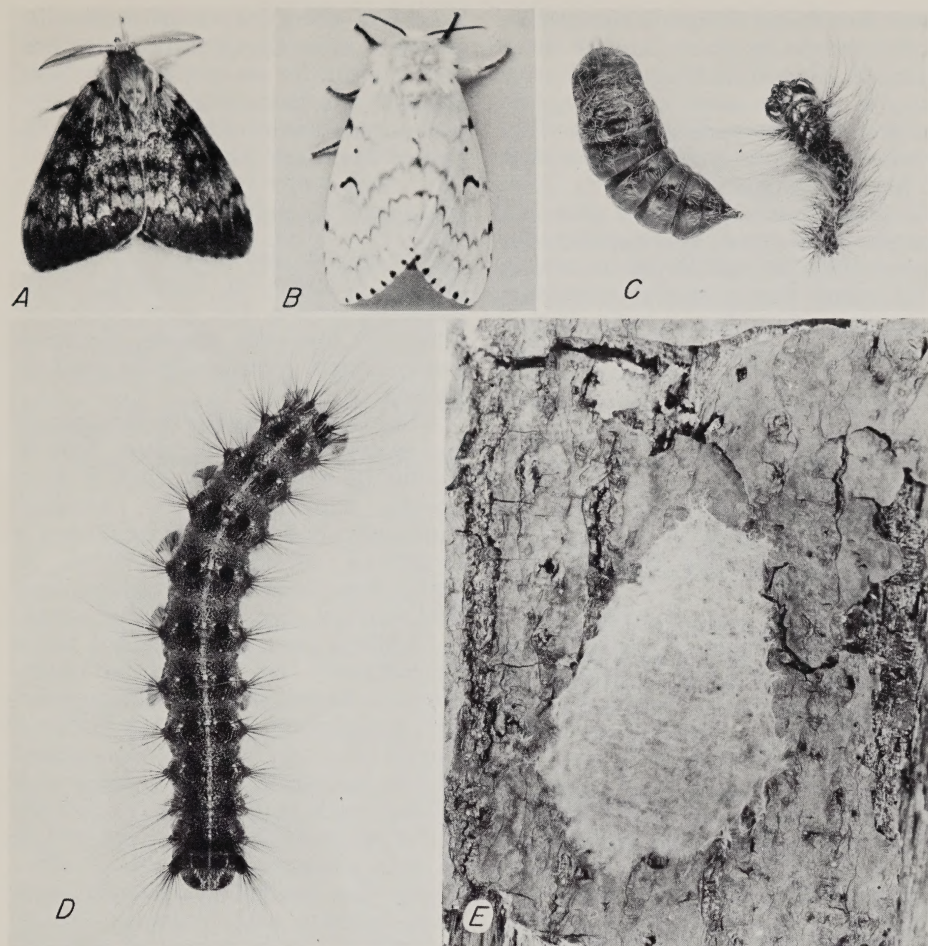
The larval feeding period is completed late in June or early July. During this period male larvae usually molt four times and female larvae, five times, but some molt more often. If the larvae completely defoliate a tree, they migrate considerable distances searching for food. In any event, full-grown larvae may wander about a good deal before changing to pupae.

The pupae are attached by silk threads to tree limbs and trunks, stones, forest debris, and the like. Large numbers are often massed together. From 10 days to 2 weeks are spent in the pupal stage.

The male moths are strong fliers; they fly vigorously in a zig-zag course on warm days. The females do not fly. When the female moth emerges, she crawls a short distance, her wings expand, and she releases a powerful odor which attracts male moths from considerable distances. Mating occurs soon thereafter, and then the female immediately lays her eggs. A large portion of the egg masses are laid on the trunk and branches of trees, but egg masses may be laid on almost anything. The hazard of long-distance dispersal of the insect is greatly increased when the eggs are laid on such objects as automobiles and trailers.

### Host Trees

Gypsy moth caterpillars feed on the foliage of a wide variety of trees and shrubs. In heavy infestations, few host species are ignored by the large



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**Figure 2.**—*A*, Adult male gypsy moth; *B*, adult female; *C*, female pupa and cast larval skin; *D*, full-grown caterpillar; *E*, egg masses laid on a white oak tree.

larvae. Like other defoliators, though, the caterpillars have distinct food preferences. All larval stages grow and develop best on oaks, willows, poplars, most birches, larch, linden, and apple. The older larvae, but not the early instars, also thrive on chestnut, hemlock, pines, and spruces. Larvae are able to survive, but few thrive on, cherries, elms, hickories, maples, or black or yellow birch. Even when they are starving, they rarely feed on butternut, walnut, locust, sycamore, yellow-poplar, or ash.

### Damage

The total acreage severely defoliated by the gypsy moth fluctuates greatly. In 1969, 255,800 acres were defoliated and in 1968, 80,000, in contrast to an all time peak of 1,487,000 acres in 1953.

The susceptibility of a forest stand to damage by the gypsy moth depends not only on the abundance of favored food species, but also on the site and stand conditions. Bess, Spurr, and Littlefield (1947) pointed out that the driest sites (such as sand plains and rocky ridges) that support



open stands are the most susceptible areas, especially where land abuse is common. On soils having an adequate supply of moisture and organic matter, forest stands are often fully stocked, vigorous, and more resistant to insect damage.

Stands of oak and mixed pine-oak are damaged most. Oaks seldom die unless they are defoliated in successive years, but a single defoliation causes considerable loss in the normal growth of the trees, and this effect on growth may persist for several years. In addition, defoliated trees become susceptible to attack by the shoe-string fungus *Armillaria mellea* (Vahl.) Quel. and the two-lined chestnut borer *Argilus bilineatus* (Web.). The effects of such attacks may not show for several years after the defoliation.

Hemlocks are usually killed in a single season if they are from 75 to 100 percent defoliated. Pines are more resistant than hemlocks, but severe defoliation kills them, sometimes not until 2 or 3 years later. Killing of some other species favored for attack by the gypsy moth, such as gray birch and aspen, also occurs.

### Natural Control

Many natural factors reduce gypsy moth populations. Winter temperatures below  $-20^{\circ}\text{F}$ . kill eggs that are unprotected by snow or other cover. Late spring frosts may kill newly hatched larvae. During severe outbreaks, when woodlands are entirely stripped of foliage, many larvae die of starvation. The immature stages of the insect are attacked by a large number of invertebrate parasites and predators. Birds eat the larvae, pupae and adults. Small mammals eat larvae and pupae found on the forest floor. Viral and bacterial diseases also take a toll. But, altogether, these factors do not prevent outbreaks from occurring periodically.

When outbreaks occur, parasites and disease are mostly responsible for ending them. In some areas, out-

breaks of the gypsy moth have not occurred even though the insect has been present for many years. In these areas it has been found that vertebrate predators have kept the population of the insect low.

### Applied Control

The gypsy moth seldom causes severe damage in healthy, well-managed forests, but since there are relatively few such stands, chemical control must occasionally be used to protect trees.

The safest insecticide to use against the gypsy moth is carbaryl. But it should be remembered that it is a poison and should be handled cautiously. Follow the manufacturer's directions carefully. Carbaryl is highly toxic to bees. It should be used with caution near streams and ponds.

Carbaryl can be applied most economically by aircraft or mist-blowers. A sprayable wettable powder containing about 80 percent carbaryl should be used. Mix 1 to  $1\frac{1}{4}$  pounds of this insecticide and 4 ounces of a sticker, such as Pinolene<sup>2</sup>, in enough water to make 1 gallon. One gallon of this mixture will cover 1 acre. Apply the insecticide after the eggs have hatched and while the larvae are still in early stages of growth. The best results are obtained when leaves are from one-third to one-half grown.

For the person with a small number of trees to protect, there are several alternatives to chemical insecticides. The bacterium *Bacillus thuringiensis*, commonly called Bt, is available in two commercial spray formulations which are registered for the control of gypsy moth larvae. These are Thuricide 90 TS and Biotrol BTB-25W. Applications are made with

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<sup>2</sup> The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval of the U.S. Department of Agriculture of any product or service to the exclusion of others which may be suitable.



ground equipment. Timing and thoroughness of application are essential to successful use.

The caterpillars can also be trapped. When about two-thirds grown, the larvae begin a daily cycle of feeding at night, then crawling down the tree at dawn to rest in some protected place during the day. By providing a suitable hiding place, you can trap the larvae. They can then be crushed or knocked into a container of kerosene. Because all the larvae on a tree may not find the trap immediately, the trap will have to be examined for several days.

One of the best traps can be made with a piece of burlap or other stiff cloth. At a convenient level, wrap a piece about 10 inches wide around the tree and secure it to the tree with a piece of string or wire. Then fold the upper half down over the string to form a canopy. The larvae will hide under this flap.

Another method of control is to remove the egg masses. These can be burned or scraped into a container of kerosene. Without removing them, the eggs can also be killed by brushing the egg mass with creosote.

Under no circumstances should egg masses or larvae be handled. Allergic reactions have been known to occur.

## Pesticide Precautions

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or when they may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticides containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

**WARNING:** Recommendations for use of pesticides are reviewed regularly. The registrations on all suggested uses of pesticides in this publication were in effect at press time. Check with your country agricultural agent, State agricultural experiment station, or local forester to determine if these recommendations are still current.

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